1.0 NEED AND PURPOSE

The Harbor Bridge is located on US Highway 181 (US 181) approximately one-half mile north of the US 181 and Interstate Highway 37 (I-37) interchange in Corpus Christi, Texas (see **Figure 1.0-1**). US 181, a six-lane divided highway, is the only continuous state/federal highway facility that provides a direct connection between the Corpus Christi Central Business District (CBD) and the communities of Portland, Gregory, Ingleside, and Aransas Pass to the north. The facility is designated as part of the National Highway System (NHS) by the Federal Highway Administration (FHWA). The Harbor Bridge was designed and built in the 1950s and opened for operation in 1959. The current bridge carries three lanes of traffic in each direction without shoulders.

I-37, US 181 and the Crosstown Expressway (SH 286) are the major highways that serve the proposed project area. The proposed project limits extend both north-south along US 181 and the Crosstown Expressway and east-west along I-37 and include: US 181 at Beach Avenue on the north; Crosstown Expressway at Morgan Avenue on the south; I-37 and Buddy Lawrence Drive on the west; and I-37 and Shoreline Boulevard on the east.

The US 181 Harbor Bridge project is listed in the Corpus Christi Metropolitan Planning Organization's (MPO) Metropolitan Transportation Plan (MTP) 2010-2035 as construction of a new bridge over the Corpus Christi Ship Channel. The proposed project is expected to be completed within the planning timeframe of the MTP but is beyond the 2013-2016 Statewide Transportation Improvement Program (STIP) planning period and is not in the fiscally-constrained portion of the MTP. The project is also listed in the Draft 2013 Unified Transportation Program under Category 6: On-System Structures Replacement and Rehabilitation; $291 million has been set aside by TxDOT for the proposed project. The estimated construction cost for the proposed project ranges from $600 to $900 million. The estimated date of completion is 2023.

1.1 NEED FOR THE PROPOSED PROJECT

The following underlying transportation deficiencies have been identified with the Harbor Bridge and US 181 in the proposed project area: 1) maintaining the long-term operation of a US 181 crossing of the Corpus Christi Ship Channel; and 2) safety risks caused by design deficiencies.

1.1.1 Maintaining the Long-Term Operation of a US 181 Crossing of the Corpus Christi Ship Channel

The Harbor Bridge is a fracture-critical structure, meaning the key structural elements supporting the bridge are not themselves supported by additional and redundant elements. This means that if a key support fails, the bridge would be in danger of collapse. This does not mean the bridge is inherently unsafe, only that there is not a second line of protection designed into the bridge.

Today the structure carries higher dead loads (the weight of the bridge itself) and live loads (the weight of vehicular traffic, wind, water and other factors) than the loads for which it was originally designed in

1959. Over the life of a bridge structure, these excess loadings fatigue the bridge members and, in turn, shorten the life span of the structure. The joints and connection members will continue to deteriorate beyond repair and will ultimately have to be replaced, even if continued maintenance efforts are performed (Texas Department of Transportation [TxDOT] 2012).

In addition, corrosion is a major factor to overcome in maintaining the structural integrity of the Harbor Bridge. The steel bridge resides in a saltwater environment, requiring routine cleaning and painting to minimize corrosion. The combination of salt-laden air, year-round windy conditions, and warm air temperatures increases the potential for steel corrosion to occur (TxDOT 2012).

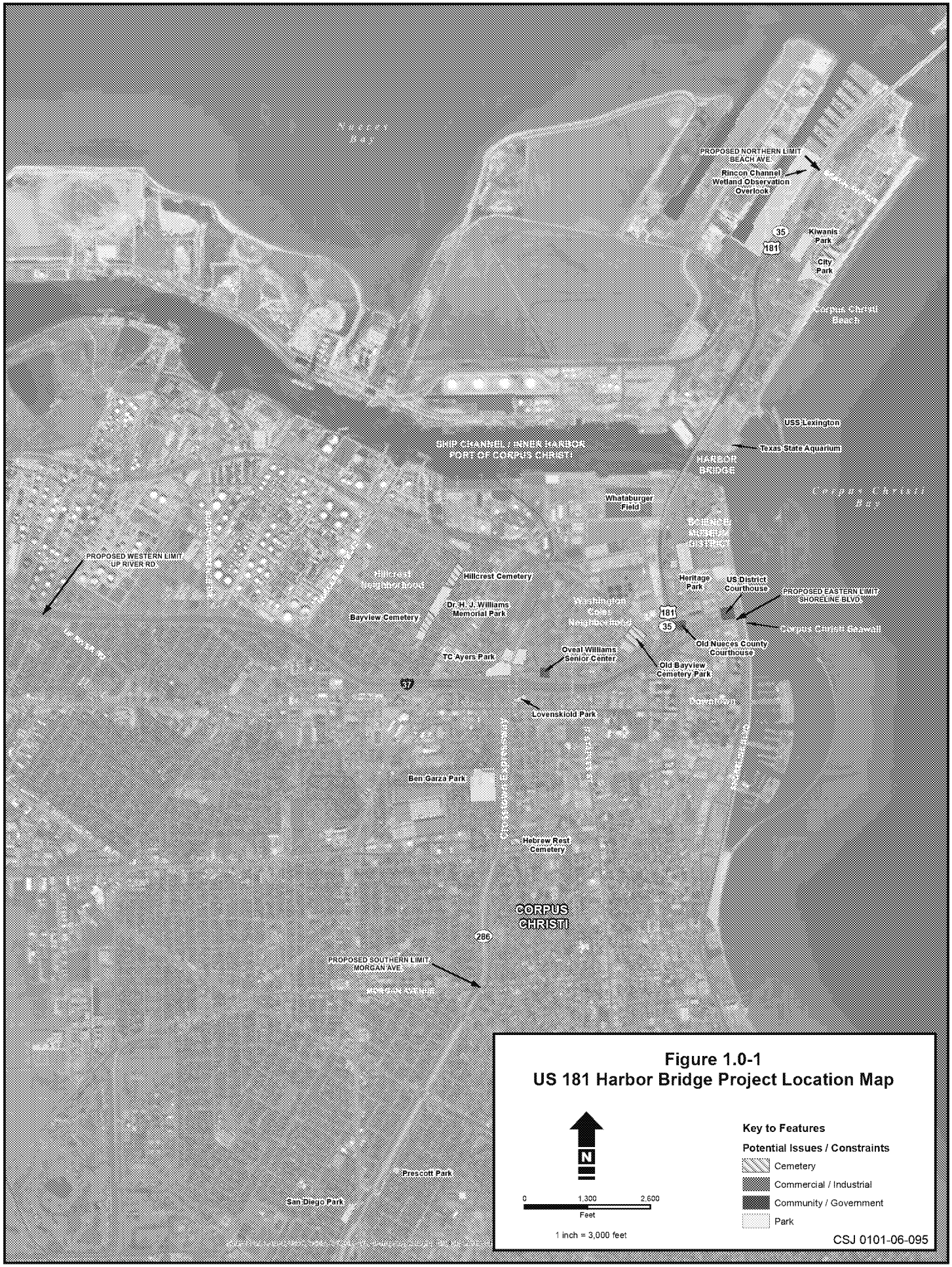
The bridge's main span had a Fracture-critical Inspection in September 2007 and a Bridge Condition Survey in December 2008. The fracture-critical inspection and condition survey did not include the pre-stressed girder or plate- girder approach spans of the bridge. During the 2007 fracture-critical inspection, widespread locations of rust were noted between adjacent steel plates and material loss due to steel corrosion was noted in members. The rust concealed and masked some areas from visual inspection. Notable findings from these assessments include: broken or missing anchor bolts; gusset plates (metal plates used to connect multiple structural members of a truss) in poor condition; and severe cracking of pre-stressed concrete beam ends (TxDOT 2012).

The structural rehabilitation necessary to extend the service life of the existing Harbor Bridge another 15 to 20 years was completed in 2011. Since 1980, maintenance costs have exceeded $70 million, and an estimated $47 million (inflation-adjusted dollars) of additional structural repairs are required if the Harbor Bridge is to remain in continued vehicular service until 2050 (TxDOT 2012). Even with repairs of this magnitude, the bridge will remain a fracture-critical structure over water.

1.1.2 Safety Risks Caused by Design Deficiencies

The current US 181 facility, including the Harbor Bridge, does not meet current FHWA and TxDOT roadway and bridge design standards. FHWA's Design Standards for Highways (23 CFR 625) and TxDOT's Roadway Design Manual and Bridge Design Manual provide guidelines for various elements of roadway and bridge design, including traffic characteristics; shoulder widths; horizontal and vertical alignment; and on- and off-ramp access. Several elements of the current US 181 facility do not meet these standards, as detailed below.

1) Neither the existing Harbor Bridge main span nor the US 181 approaches have shoulders, contributing to increased levels of congestion when even minor traffic accidents and breakdowns occur. The lack of shoulders also means the clearance between the travel lanes and the railing on the existing bridge does not meet current standards (TxDOT Roadway Design Manual Figure 3-15).


PROPOSED NORTHERN LIMIT
BEACH AVE
Rincon Channel
Wetland Observation
Overlook
35
181
Kiwanis
Park
City
Park
USS Lexington
Texas State Aquarium
HARBOR
BRIDGE
Whataburger
Field
Heritage
Park
US District
Courthouse
PROPOSED EASTERN LIMIT
SHORELINE BLVD
Old Nueces County
Courthouse
Old Bayview
Cemetery Park
PROPOSED WESTERN LIMIT
UP RIVER RD
Hillcrest Cemetery
Dr. H. J. Williams
Memorial Park
Bayview Cemetery
TC Ayers Park
Oveal Williams
Senior Center
Lovenskiold Park
Ben Garza Park
Hebrew Rest
Cemetery
CORPUS
CHRISTI
286
PROPOSED SOUTHERN LIMIT
MORGAN AVE
Prescott Park
San Diego Park
Figure 1.0-1
US 181 Harbor Bridge Project Location Map
N
0
1,300
2,600
Feet
1 inch = 3,000 feet
Key to Features
Potential Issues / Constraints
Cemetery
Commercial / Industrial
Community / Government
Park
CSJ 0101-06-095

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2) The existing US 181 approaches to the Harbor Bridge are on a five percent vertical grade that, when combined with the horizontal curvature on both the north and south ends of the existing bridge, creates a situation where vehicles can be traveling at downhill speeds entering into sharp "S" curves at speeds faster than posted speed limits. The design standard for the US 181 facility within the project limits is a maximum four percent grade (TxDOT Roadway Design Manual Table 3-15).

3) Certain ramp lengths within the project limits do not provide sufficient acceleration or deceleration distances to meet current design standards for freeway ramps (TxDOT Roadway Design Manual Figure 3-36). The US 181 northbound entrance ramp from Spur 544/Mesquite Street in Downtown Corpus Christi does not provide the acceleration distance prescribed under current design standards for traffic to merge as desired with traffic from the adjacent Antelope Street on-ramp and the US 181 northbound main lanes. This ramp provides vehicles with an acceleration distance of 400 feet, whereas the design standard for acceleration distance for this type of ramp is 550 feet. The US 181 southbound exit ramp to the Port Area (Power Street) has a deceleration distance of 350 feet, which, when combined with this ramp's horizontal curvature and the steep vertical grade coming down off of the Harbor Bridge, makes it difficult for vehicles, particularly large trucks, to decelerate as desired under current standards before merging with local traffic on the service road. The standard deceleration distance for this type of ramp is 455 feet. The US 181 southbound exit ramp to downtown Corpus Christi does not provide sufficient distance for motorists to decelerate as desired under current standards before reaching the traffic-lighted intersection at Spur 544. This ramp provides vehicles with a deceleration distance of 500 feet, whereas the design standard for deceleration distance for this type of ramp is 800 feet.

4) The current configuration of US 181 southbound just south of the Harbor Bridge does not meet current design standards for exit ramp spacing (TxDOT Roadway Design Manual Figure 3-37). Approaching downtown Corpus Christi from the north, motorists are presented with a choice of three separate destinations via US 181 (downtown Corpus Christi, I-37/SH 286, and Staples Street) from the same point on the highway. The spacing between these three exit ramps does not comply with current design criteria, which call for a minimum of 1,000 feet between successive exit ramps. In addition the ramp to downtown Corpus Christi is an undesirable left-hand exit, which the TxDOT Roadway Design Manual describes as a "[violation] of driver expectancy" which "may adversely affect operation and safety characteristics."

Both US 181, including the Harbor Bridge, and I-37 within the proposed project area are designated major hurricane evacuation routes (TxDOT 2011). US 181 is the primary evacuation route for San Patricio County and an alternate route to I-37 for the city of Corpus Christi. During storm events, I-37 is used for evacuation until the traffic volumes reach the maximum highway capacity, which includes the use of the shoulder evacuation lane and contraflow lanes (reversing the south bound lanes). Once the traffic volume on I-37 reaches capacity, traffic is directed to US 181. Therefore, a major evacuation would use both the Harbor Bridge and the Joe Fulton Trade Corridor (Navigation Boulevard, Market Street and Causeway Boulevard) running from US 181 along the north side of the Inner Harbor to Carbon Plant Road, which connects to I-37. Given the design deficiencies outlined above, there would be an increased risk of US 181 becoming unnecessarily congested during an emergency hurricane evacuation.

1.2 PURPOSE OF THE PROPOSED PROJECT

The purpose of the proposed project is to:

1) Maximize the long-term highway operability of the US 181 crossing of the Corpus Christi Ship Channel; and
2) Improve safety for the traveling public, including during hurricane evacuations.

1.3 PROJECT OBJECTIVES

In addition to the primary purpose outlined above, TxDOT and FHWA seek to achieve the following objectives, to some degree, in implementing the proposed action:

1) Provide the transportation infrastructure to support the economic opportunities in the area; and
2) Consider the connectivity of US 181 to the local roadway system and its effect on adjacent neighborhoods.

These objectives are important in the overall context of the proposed project in that they address additional underlying problems, described below, associated with the Harbor Bridge and US 181 in the proposed project area.

1.3.1 Provide the Transportation Infrastructure to Support Economic Opportunities in the Area

The Corpus Christi MPO identifies the replacement of deficient bridges as a type of project intended to achieve the goals of its MTP. Specifically, the MPO lists the following goals of the streets and highways plan (Corpus Christi MPO 2011):

- Reduce congestion by maximizing the capacity and efficiency of the existing major highways and streets
- Improve the safety of our transportation network through improved efficiency and effectiveness of major street and highway facilities
- Provide new facilities, improved facilities and transportation services that expand the economic opportunities in the area
- Provide new facilities, improved facilities and transportation services that will support the maintenance of our attainment status and improve air quality
- Provide new facilities, improved facilities and transportation services that will Increase the value of transportation assets

The MTP lists the replacement of the Harbor Bridge—prioritized partly on the basis of its use as a hurricane evacuation route—as one of the projects whose implementation would be expected to

achieve the above goals. In addition, the MTP describes US 181 as a critical connection for the region's efficient movement of freight and emergency evacuation.

With respect to regional connectivity, the MPO considers US 181 a priority corridor in the future expansion of Interstate Highway 69 (I-69) to connect directly to the Port of Corpus Christi, the 6th largest port in the United States in total tonnage and the primary economic engine for the Coastal Bend.

1.3.2 Consider the Connectivity of US 181 to the Local Roadway System and its Effect on Adjacent Neighborhoods

The combination of US 181 and I-37, constructed in the late 1950s to early 1960s, modified the local roadway network, making access to uptown and downtown Corpus Christi from the residential areas north of I-37 more lengthy and less direct. Locally, this has had the effect of creating the perception of a barrier between those neighborhoods and the Corpus Christi CBD. In addition, more recently, access to the City's museum district (including Bayfront Science Park) on the east side of US 181 as well as major traffic generators on the west side (Whataburger Field professional baseball stadium, the Concrete Street Amphitheater, and the Congressman Solomon P. Ortiz International Center) is not direct and results in congestion on US 181 and local downtown roadways during major events.

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